

Faena Arts Center

Miami Beach, FL



Team

Owner:

Faena Properties

Architect:

OMA & Revuelta Architecture International

Structural Engineer:

DeSimone Consulting Engineers, Miami, FL

General Contractor:

Layton Construction, Sandy, UT

Concrete Contractor/Reinforcing Bar Placer:

SPS, Lithonia, GA

Construction Program Manager:

Gardiner & Theobald

Reinforcing Bar Fabricator:

Pacific Coast Steel, San Diego, CA

Total Project Size:

200,000 sq ft

Floor System:

Flat Plate

Framing System:

Concrete

Award:

2016 CRSI Award Winner—
Commercial Facilities Category

Photography:

Layton Construction, Sandy, UT)

The owner wanted create a world-class museum. It had to be an architectural space where every visible concrete element served an architectural and structural purpose, as well as maintaining a natural concrete appearance.

STRUCTURAL FRAMING SYSTEM

The use of a combination of steel sheet piles and an unreinforced concrete tremie slab, to construct a 22-foot deep underground parking garage that is a stone's throw from the ocean and that is 3' above the ground water table, especially considering the tight site constraints which was also economical. This system created a "bathtub" which allowed the contractor to work in the dry.

UNIQUE STRUCTURAL AND/OR ARCHITECTURAL DESIGN FEATURES

The project featured a number of structural challenges. First was how to construct a 22-foot deep underground parking garage that is a stone's throw from the ocean and that is 3 feet above the ground water table. This was also the first project in Miami Beach to be permitted to temporarily vacate a public street to perform the excavation and then return an elevated street to the city. We considered many different schemes including soil mixing that we have used on a number of other South Florida projects. Through early coordination with the contractor, it was decided that the most economical scheme would be to use a combination of steel sheet piles and an unreinforced concrete tremie slab, especially considering the tight site constraints. This system created a "bathtub" which allowed the contractor to work in the dry. The permanent 16" thick hydrostatic slab and basement walls were the cast directly against these elements.

The next challenge was the construction sequence of the Faena Forum. The cylindrical portion of the building, located at the south end of the site, has the majority of its base truncated with a wedge cut away that contributes to create the plaza space facing Collins Avenue. The result is that the cylinder is cantilevered from the cube. This required that a significant portion of the cube be constructed to anchor the cylinder prior to shoring of the cylinder being removed. This sequence allows the weight of the cube to counteract the overturning forces of the cylinder. A finite-element construction sequencing computer analysis was performed to determine exactly how much of the cube had to be built before the cylinder was safely anchored. Equally as challenging was the reinforcement detailing of the three-dimensional arches and catenaries of the facade. Special consideration was given to the selection of the reinforcement bar size to allow for the creation of the unique architectural shapes. Maintaining small bar dimensions was key to minimizing bar congestion at the intersection of multiple arches and catenaries as well as being able to bend the bars to the shape of the cylindrical facade. Self-consolidating concrete was used to mitigate the inevitable reinforcement congestion at the intersection nodes and prevent concrete defects.

REASONS FOR CHOOSING REINFORCED CONCRETE

- High-strength grade 75ksi rebar was used to mitigate congestion at the intersection of the multiple diagonal elements.